

**Prepared Statement of Douglas Faulkner
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U.S. Department of Energy
before the
Subcommittee on Energy
Committee on Science
U.S. House of Representatives
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I appreciate the opportunity to discuss the Department of Energy's Steel and Aluminum Industries of the Future Research and Development (R&D) activities and to comment on H.R. 3890, the Steel and Aluminum Energy Efficiency and Technology Competitiveness Act.

The DOE's steel R&D effort was established in 1986 with a goal to increase significantly the energy efficiency of processes that produce steel under the Steel Initiative (Public Law 99-190). The Steel Initiative was later expanded by the Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1988, to include aluminum, which is commonly referred to as the Metals Initiative. The 1988 Act directs the Secretary to re-establish an industrial energy conservation and a competitive technology program to conduct scientific research and development of steel and aluminum technologies. The purpose of the program is to increase the energy efficiency, international competitiveness and environmental performance of these American industries by aligning the research and development resources of industry and government. The program promotes collaborative, cost-shared, public-private research and pre-competitive development, bringing together the expertise and experience of the metals industries, the DOE National Laboratories, universities, states and others.

Steel Industry of the Future

As members of the Subcommittee know, steel production is one of the most energy-intensive industries in the United States, and steelmakers are highly motivated to reduce energy intensity. While the steel industry has made significant progress in reducing energy intensity over the past several decades, the U.S. steel industry consumes approximately two quadrillion Btu's (quads) of energy each year, accounting for about two percent of all U.S. energy consumption. The cost of purchasing this amount of energy represents about 15 percent of the total manufacturing cost for steel. We estimate that the steel industry can save 20 to 30 percent of its energy costs by applying advanced energy efficiency technologies.

The strategy of DOE's Steel Industry of the Future R&D effort is to foster both revolutionary ironmaking and steelmaking projects as well as incremental improvements to existing processes, thereby addressing both long-term goals and short-term needs. The program also strives to expand the industry's fundamental base of knowledge to optimize key processes and resource efficiency. Since 2001, the program has increased its emphasis on steelmaking "Grand Challenge" concepts that promise to maximize energy savings. This shift in focus should produce large drops in industry energy intensity over the long-term.

Both industry and universities widely participate in the Steel Industries of the Future R&D effort, providing both cost-sharing and in-kind support. Universities not only provide innovative technological solutions, they also indoctrinate the next generation of the scientific and engineering workforce. The involvement of industry accelerates technology transfer and dissemination of research results. Industry partners represent the diversity of the steel industry and include integrated producers, mini-mill producers, suppliers, and end-users in several industries. Strong industry involvement ensures direct application of research results and testifies to the importance of this cost-shared research partnership. Involving industry in the early R&D stages helps accelerate the development and application of energy-efficient technologies.

In the mid 1990s, DOE facilitated the development of a steel industry technology roadmap to help identify energy efficiency priorities mutually beneficial to government and industry. Led by the American Iron and Steel Institute, the industry worked to develop broad goals for the program and established a unified research agenda – the Steel Industry Technology Roadmap - to guide collaborative research, development, and demonstration. By reaching a consensus on industry-wide goals and R&D priorities, the industry has been able to attract public and private investment for new technology development. Collaborative teams share the costs and risks. The Roadmap was revised in 2002 to reflect changes in the industry and emerging technological priorities. DOE and its partners have jointly commercialized about 15 technologies and have disseminated valuable scientific information that will help steelmakers improve their productivity, efficiency, and product quality.

The R&D priorities and needs identified in the Roadmap provided valuable input to DOE's internal planning process. DOE is providing cost-sharing for approximately 25 steel-specific R&D projects, which when combined with other funds, totals \$10 million annually in public-private investment.

These include:

- **Mesabi Nugget Ironmaking.** DOE has successfully demonstrated the technical and economical viability of this direct ironmaking technology which uses 30% less energy compared to the traditional route of making iron in a blast furnace. The Department will participate in a full-scale pilot campaign to reduce the technical risk even further. This revolutionary technology eliminates the need for the environmentally problematic cokemaking process required for traditional ironmaking.
- **Novel Direct Steelmaking by Combining Microwave, Electric Arc, and Exothermal Heating Technologies.** We have made significant progress in defining this next generation steelmaking concept which would eliminate the need for a separate ironmaking step and greatly reduce the energy intensity of the

overall steelmaking process. This technology should be market-ready by the end of the decade.

- **Future Steelmaking Processes.** Carnegie Mellon University and U.S. Steel are examining the feasibility of using a combination of proven technologies to produce iron more efficiently and with lower capital and operating costs. The goal is to develop a flexible fossil fuel-based process as an alternative to energy- and emissions-intensive coke-based blast furnace ironmaking.

Aluminum Industry of the Future

While the U.S. aluminum industry has reduced its energy intensity by 58 percent over the past 40 years, the aluminum industry still consumes approximately 800 trillion Btu of energy each year, or slightly below 1% of all U.S. energy use. Based on a recent study, the energy consumed by the U.S. primary aluminum industry is more than three times greater than what is theoretically necessary. In addition to the savings in primary aluminum production, secondary processing offers many cost-effective savings opportunities.

Like the Steel Industry of the Future R&D effort, this government-industry partnership performs high-impact research projects on primary, melting, and forming operations in aluminum production. Fifty percent of DOE's funding is directed toward lowering the energy required to produce primary aluminum metal, the largest opportunity for improving energy efficiency.

Current projects include:

- **Aluminum Carbothermic Technology.** We have made significant progress in designing the prototype carbothermic reactor. Successful development of this revolutionary technology will provide 23% energy saving and 32% in emissions reduction. Additionally, this technology has a smaller footprint than the existing Hall-Heroult Cell and could be sited near the secondary customers plant.

- **Vertical Flotation Melter.** Researchers have developed a continuous melting system that uses the thermal energy of the flue gas to preheat scrap aluminum. When fully commercialized, this technology is projected to save almost 10 trillion Btu of energy in the aluminum industry. This technology has been proven at the single-plant level. DOE is participating in a technology validation project to accelerate market acceptance.

The Steel and Aluminum Energy Efficiency and Technology Competitiveness Act

DOE's Office of Energy Efficiency and Renewable Energy has reviewed H.R. 3890, which would enhance DOE's steel and aluminum initiatives. The bill would do the following.

1. Reauthorize appropriations to DOE for the DOE program under the Steel and Aluminum Energy Conservation and Technology Competitiveness Act of 1988 of \$10 million for each of fiscal years 2005-2009.

The Department does not object to this authorization. The Department's Fiscal Year 2005 request for the Steel and Aluminum Industries of the Future is \$3.8 million for steel and \$2.7 million for aluminum, for a total of \$6.5 million. Funding for this program is always subject to the annual appropriations process.

2. Amend the list of projects DOE is to consider for research by:

- amending the project listed as "the development of advanced coatings for sheet steels" to "the development of advanced sheet and bar steels," and
- expanding the list to include development of technologies that reduce greenhouse gas emissions.

We believe that both of these issues are currently being addressed through the Steel Industry of the Future R&D implementation. As mentioned above, the IOF partnership

focuses on developing a wide range of new technologies that improve productivity, lower energy consumption, and reduce emissions. The research focus areas are chosen by industry and cover key steel manufacturing processes and a broad range of product applications, including “development of advanced sheet and bar steels.”

DOE is already working in partnership with the U.S. steel industry through the American Iron and Steel Institute (AISI) to help it implement activities in support of AISI achieving its Climate VISION commitment. A Climate VISION workplan is being developed where AISI will be voluntarily collaborating with the federal government on near-term energy efficiency activities, cross-sectoral projects, and R&D to promote and commercialize advanced technologies.

3. Abolish the National Institute of Standards and Technology’s program of steel and aluminum research whose purpose was to provide necessary instrumentation and measurement R&D in support of activities conducted by DOE.

The current Steel and Aluminum Industries of the Future partnerships address selected instrumentation and measurement research and development that are considered high priority by the industry. We have no objection to the elimination of this program.

4. Update the requirement for DOE to report annually to the President and Congress on progress of the program to require a report at the close of FY2005 and at the close of each following fiscal year.

The DOE publishes annual reports for the Steel and Aluminum Industries of the Future R&D activities. Additionally, the Department publishes a multi-year program plan and an annual operating plan that includes the technical objectives and milestone charts for the Aluminum and Steel Program areas. It would be helpful if the requirement for a “Management Plan” under the current Metals Initiative were updated to describe current roles and responsibilities of the organizations involved and to incorporate result-driven program management principles such as “analytic-based planning” and “management by milestone” that we currently use. The “Research Plan” under the Metals Initiative should

also be modified to incorporate long-term strategic planning and priority setting and include the R&D needs identified in the industry technology roadmaps.

Madame Chair, this concludes my prepared statement. I am happy to answer any questions the Subcommittee may have.